

REMARKS

Claims 19 is amended, claims 13-18 and 25-50 are canceled in this response without prejudice or disclaimer, and claims 62-88 are added; as a result, claims 19-24, and 51-88 are now pending in this application.

Applicant reserves the right to file and prosecute the subject matter of claims 13-18 and 26-50 in one or more continuation or divisional applications.

The amendments to the claims are fully supported by the specification as originally filed. No new matter is introduced. Support for the amendments to claim 19 may be found for example in the specification on page 10 at lines 16-27. Support for new claims 62-88 may be found for example in claims 19-23 as originally filed, and in the specification on page 9, line 8 through page 11, line 30.

Applicant respectfully requests reconsideration of the above-identified application in view of the amendments above and the remarks that follow.

First §103 Rejection of the Claims

Claims 19, 21-25, 51-54, 56-58, and 60-61 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Gillespie (U.S. 5,898,858) in view of Capote et al. (U.S. 6,121,689) and Gilleo (U.S. 6,265,776). Claim 25 is canceled, so the rejection of claim 25 is moot.

Claims 19, 21-24, 51-54, 56-58, and 60-61 are not obvious, and thus are patentable over the proposed combination of Gillespie, Capote et al. and Gilleo because the proposed combination fails to teach or suggest all of the claimed subject matter included in claims 19, 21-24, 51-54, 56-58, and 60-61.

Claims 19, 21-24, 51-54, 56-58, and 60-61 include claimed subject matter not taught or suggested by the proposed combination of Gillespie, Capote et al. and Gilleo. For example, claim 19 as now amended recites,

an adhesive layer covering the first side of the first semiconductor device with a first surface of the adhesive layer contacting the first side, the adhesive layer having an array of **column-shaped openings substantially aligned with one or more connection pads of the first array of connection pads and having a chamfer**, opposite the first surface of the adhesive layer, at each of the column-shaped openings; and

a conductive material filling the array of column-shaped openings. (Emphasis added).

Thus, claim 19 includes a column-shaped opening have a chamfer, and further includes a conductive material filing the array of column-shaped openings. The Final Office Action on page 2 admits,

Gillespie does not explicitly disclose the chip package includes an adhesive layer covering the chip and having an array of openings aligned with connection pads having a chamfer opposite the first surface of the adhesive layer at each of the openings and a conductive material substantially filing the array of openings.

Applicant's representatives fail to find in Capote et al., a teaching or suggestion of a column-shaped openings having a chamfer. Further, since Capote et al. fails to teach or suggest a column-shaped openings having a chamfer, Capote et al. fails to teach a suggest a conductive material filling the array of column-shaped openings, as these column-shaped openings are recited in claim 19.

The additional disclosure of Gilleo fails to cure the deficiencies of Gillespie and Capote et al. In contrast to the subject matter included in claim 19, Gilleo recites,¹

After the solder bumps 14 have been provided with a flux coating 16, **the spaces on the wafer surface between the solder bumps 14 are provided with an underfill** in the liquid phase. The liquid underfill is applied to the wafer by spin coating, screen printing, or any of the common methods for applying liquids to surfaces. The resulting device is depicted in FIG. 4. Specifically, **FIG. 4 shows a wafer 12 having solder bumps 14 each having a flux coating 16. The underfill material 18 is deposited on the wafer 12 in the spaces between the solder bumps 14.** Since the flux coating 16 has a low surface energy, the underfill 18 does not become a coating over the flux 16. This is because surface chemistry principles require that wetting will only occur if the surface energy of the liquid (i.e., the underfill 18) is lower than that of the solid surface (i.e., the flux coating 16). Since the materials are selected such that the flux liquid has a higher surface energy than the flux coating, **a receding contact angle results at the interface between the flux coating 16, the underfill 18, and the surrounding air.**

¹ See Gilleo at column 7, line 52 through column 8, line 3.

Thus, Gilleo discloses underfill material deposited on the wafer *in the spaces between the solder bumps*. However, there is no teaching or suggestion in Gilleo of column-shaped openings having a chamfer, as recited in claim 19. Gilleo states that the underfill merely fills the spaces between solder bumps. In addition, Gilleo discloses, "solder bumps 14 each having a flux coating 16." Therefore, Gilleo discloses that each solder bump has a flux coating, as shown, for example, in Fig. 4 and Fig. 5 of Gilleo. The flux coating as disclosed in Gilleo is in contact with the fill material 18, and so Gilleo cannot disclose, "a conductive material **filling the array** of column-shaped openings," as recited in claim 19 because Gilleo discloses that both solder bumps *and* flux coatings are in contact with the fill material. (Emphasis added). Hence, any "openings" (wherein Applicant expressly does not admit that Gilleo teaches or suggest an opening) in the fill material of Gilleo includes both a solder bump and a flux coating. Thus, Gilleo fails to teach or suggest a conductive material filling the array of column-shaped openings as recited in claim 19.

Claims 21-24, 51-54, 56-58, and 60-61 depend from claim 21, and so includes all of the subject matter included in claim 19. Thus, the proposed combination of Gillespie, Capote et al., and Gilleo fails to teach or suggest all of the subject matter included in claims 21-24, 51-54, 56-58, and 60-61.

Because the proposed combination of Gillespie, Capote et al., and Gilleo fails to teach or suggest all of the subject matter included in claims 19, 21-24, 51-54, 56-58, and 60-61, claims 19, 21-24, 51-54, 56-58, and 60-61 are not obvious, and are patentable, over the proposed combination of Gillespie, Capote et al., and Gilleo.

The Final Office Action fails to state a prima facie case of obviousness with respect to claims 19, 21-24, 51-54, 56-58, and 60-61 because the Final Office Action fails to meet the requirements for forming the proposed combination of Gillespie, Capote et al. and Gilleo.

The Examiner has the burden under 35 U.S.C. § 103 to establish a *prima facie* case of obviousness. *In re Fine*, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). To do that the Examiner must show that some objective teaching in the prior art or some knowledge generally available to one of ordinary skill in the art would lead an individual to combine the relevant teaching of the references. *Id.*

The *Fine* court stated that:

Obviousness is tested by "what the combined teaching of the references

would have suggested to those of ordinary skill in the art." *In re Keller*, 642 F.2d 413, 425, 208 USPQ 871, 878 (CCPA 1981)). But it "cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination." *ACS Hosp. Sys.*, 732 F.2d at 1577, 221 USPQ at 933. And "teachings of references can be combined *only* if there is some suggestion or incentive to do so." *Id.* (emphasis in original).

Further, the teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991); MPEP § 2143. The Examiner must avoid hindsight. *In re Bond*, 910 F.2d 831, 834, 15 USPQ2d 1566, 1568 (Fed. Cir. 1990).

In an attempt to meet these requirements, the Final Office Action on page 3 states,

Therefore, it would have been obvious to one having ordinary [sic] in the art at the time the invention was made to modify the device structure of Gillespie by having an adhesive layer covering the chip and having an array of opening aligned with connection pads having a chamfer and a conductive material substantially filling the array of openings, as taught by Capote et al. and Gilleo, in order to provide a flip chip configuration without bending the chip and substrate and form the contact angles at the interface between the flux coating and the underfill layer.

Applicant respectfully disagrees with these statements, and further submits that the Final Office Action fails to point to any disclosure or any portion of the cited documents to support these statements. Without such support, the Final Office Action fails to meet the requirements as quoted above for forming the proposed combination of Gillespie, Capote et al. and Gilleo, and thus is attempting to combine the teachings of Gillespie, Capote et al. and Gilleo based on Applicant's disclosure using impermissible hindsight.

By failing to meet the requirements for forming the proposed combination of Gillespie, Capote et al. and Gilleo, the Final Office Action fails to state a *prima facie* case of obviousness with respect to claims 19, 21-24, 51-54, 56-58, and 60-61.

For at least the reasons stated above, the 35 U.S.C. § 103(a) rejection of claims 19, 21-24, 51-54, 56-58, and 60-61 cannot stand. Applicant respectfully requests withdrawal of these rejections of claims 19, 21-24, 51-54, 56-58, and 60-61, and reconsideration and allowance of these claims.

Second §103 Rejection of the Claims

Claims 20, 55, and 59 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Gillespie in view of Capote et al. and Gilleo as applied to claim 19 above, and further in view of Toyosawa et al. (U.S. 6,337,257).

Claims 20, 55, and 59 are not obvious, and thus are patentable over the proposed combination of Gillespie, Capote et al., Gilleo, and Toyosawa et al. because the proposed combination fails to teach or suggest all of the claimed subject matter included in claims 20, 55, and 59.

Applicant believes they have established that the proposed combination of Gillespie, Capote et al. and Gilleo fails to teach or suggest all of the claimed subject matter included in claim 19. The Final Office Action fails to point out, and Applicant's representatives fail to find in the additional discourse of Toyosawa et al., a teaching or suggestion of the claimed subject matter included in claim 19 and missing from the proposed combination of Gillespie, Capote et al., and Gilleo. Thus the proposed combination of Gillespie, Capote et al., Gilleo and Toyosawa et al. also fails to teach or suggest all of the claimed subject matter included in claim 19.

Claims 20, 55, and 59 depend from claim 19, and therefore include all of the subject matter included in claim 19. Thus, the proposed combination of Gillespie, Capote et al., Gilleo, and Toyosawa et al. fails to teach or suggest all of the subject matter included in claims 20, 55, and 59. Because the proposed combination of Gillespie, Capote et al., Gilleo and Toyosawa et al. fails to teach or suggest all of the subject matter included in claims 20, 55, and 59, claims 20, 55, and 59 are not obvious, and are patentable, over the proposed combination of Gillespie, Capote et al., Gilleo, and Toyosawa et al.

The Final Office Action fails to state a prima facie case of obviousness with respect to claims 20, 55, and 59 because the Final Office Action fails to meet the requirements for forming the proposed combination of Gillespie, Capote et al. and Gilleo.

Applicant believes they have established that the Final Office Action fails to meet the requirements for forming the proposed combination of Gillespie, Capote et al. and Gilleo. In rejecting claims 20, 55, and 59, the Final Office Action provides no addition support for forming this proposed combination of Gillespie, Capote et al., and Gilleo. Thus, the Final Office Action

fails to meet the requirements for forming the proposed combination of Gillespie, Capote et al., Gilleo and Toyosawa et al.

By failing the meet the requirements for forming the proposed combination of Gillespie, Capote et al. Gilleo, and Toyosawa et al., the Final Office Action fails to state a *prima facie* case of obviousness with respect to claims 20, 55, and 59.

For at least the reasons stated above, the 35 U.S.C. § 103(a) rejection of claims 20, 55, and 59 cannot stand. Applicant respectfully requests withdrawal of these rejections of claims 20, 55, and 59, and reconsideration and allowance of these claims.

New Claims

Applicant respectfully submits that new claims 62-88 are not obvious, and are patentable, over the references cited in the Final Office Action, when the cited documents are taken either alone or in combination. Consideration and allowance of new claims 62-88 is respectfully requested.

Reservation of Rights

Applicant does not admit that references cited under 35 U.S.C. §§ 102(a), 102(e), 103/102(a), or 103/102(e) are prior art, and reserves the right to swear behind them at a later date. Arguments presented to distinguish such references should not be construed as admissions that the references are prior art.

CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney (612) 371-2132 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

SUAN J. BOON

By his Representatives,

SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A.
P.O. Box 2938
Minneapolis, MN 55402
(612) 371-2157

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By Robert Madden
Robert Madden
Reg. No. 57,521

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LATE GUNNO
Name

Kate G
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